SWIVEL RETRACTOR BLADE ASSEMBLY

Claim of Priority

[0001] This application claims the benefit of U.S. Provisional Patent Application No. 60/418,774 filed October 15, 2002.

Background of the Invention

[0002] The present invention relates to a retractor blade which is adjustably connected to a retractor shaft, and more particularly, to a retractor blade connected to a retractor shaft with a ball socket connection allowing free movement while limiting the range of motion of the retractor blade relative to the retractor shaft.

Detailed Description of Related Art

[0003] Co-pending and co-owned Patent Application No. 10/113,663 shows a multi-position ratchet mechanism for connecting a retractor blade to a ring, which is incorporated by reference. The 10/113,663 application is not prior art, but the development of the technology disclosed in that application assisted the applicant in determining that a need existed for the invention disclosed herein.

[0004] The new clamp allows for a retractor blade to be connected by a retractor shaft to the clamp when the clamp is connected to a ring, when the clamp is pivoted downwardly into the wound or from left to right relative to the ring, a fixably mounted retractor blade connected to the retractor shaft as has been traditionally done in the prior art and shown in U.S. Patent No. 4,354,763, does not maintain the retractor blade in a substantially perpendicular alignment relative to the direction of retraction. The retractor blade is most effective when the majority of the surface area is against tissue (i.e., perpendicular to the direction of retraction) so that proper retraction can occur.

[0005] Accordingly, with the development of the multi-positioning clamp as described in U.S. Patent Application No. 10/113,663, a need has arisen for improved connection intermediate the retractor blade and the retractor shaft so that the intimate contact with the retractor blade against the tissue may be maintained in spite of the angular relationship of the retractor shaft relative to the multi-position ratchet mechanism, or other angularly adjustable clamp.

Summary of the Invention

[0006] A need exists for an improved connector intermediate a retractor blade and retractor shaft so that an optimal amount of retractor blade may be maintained against tissue in spite of the angular position of the retractor shaft relative to a clamp connecting the retractor shaft to a ring.

[0007] A need also exists for an improved retractor blade assembly which is free to rotate to an optimal retraction position when the retractor shaft is not necessarily oriented along a vector oriented in the direction of retraction.

[0008] Another need exists for the ability to maintain the retractor blade perpendicular to the direction of retraction when the retractor shaft is not optimally oriented for such retraction.

[0009] Accordingly, a retractor assembly is comprised of a retractor blade connected by a stem to a connector and the retractor shaft. The retractor shaft is preferably connected to a ring, which is not necessarily circular, by a rotatable and/or pivoting clamp. The connector allows for the self adjustability of the angle of the retractor blade relative to the retractor shaft as the angle of the retractor shaft relative to the ring is adjusted at the

clamp. The connector is preferably a pivoting type connector, but others could also be employed.

[00010] Since rings are typically located proximate an elevation of the incision, in the preferred embodiment a limited travel is allowed in the up and down direction. The side to side, or lateral travel, of the retractor shaft relative to the stem connected to the retractor blade in the preferred embodiment is about 120° range of motion so the connector allows for the pivoting of the retractor blade relative to the retractor shaft sufficient to account for an offset of the retractor blade relative to the ring in the direction of the retraction.

[00011] It is preferred that the type connection connect the retractor blade to the retractor shaft while allowing the desired range of motion of the ball retractor blade relative to the retractor shaft.

Brief Description of the Drawings

[00012] The particular features and advantages of the invention as well as other objects will become apparent from the following description taken in connection with the accompanying drawings in which:

Figure 1 is a top perspective view of a retractor blade assembly having a retractor blade connected to a retractor shaft with a connector in accordance with the preferred embodiment of the present invention;

Figure 2 is a side perspective view of the shaft portion of the retractor blade assembly shown in Figure 1;

Figure 3 is a top perspective view of a flange clevis of the retractor blade assembly shown in Figure 1;

Figure 4 is a top perspective view of a pivot flange of the retractor blade assembly shown in Figure 1;

Figure 5 is a side perspective view of a blade attachment boss of the retractor blade assembly shown in Figure 1; and

Figure 6 is a practical application of the use of the retractor blade in conjunction with the retractor shaft and connected in accordance with the present invention with one location option shown in phantom.

Detailed Description of the Preferred Embodiment

[00013] Accordingly, Figure 1 shows an assembly **10** of the preferred embodiment. The assembly **10** is comprised of a retractor blade **12** having a stem or shoulder **14**. The assembly **10** also has a retractor shaft **16**. The retractor shaft **16** and the retractor blade **12** are joined at connector **18** which is preferably a pivoting type connection. Other connectors like a ball and socket type connection could also be utilized.

[00014] A description of the component parts is helpful to understand the anticipated positioning in order to show the capabilities of the assembly **10** shown in Figure 1 and Figure 6. The retractor shaft **16** is preferably equipped with a plurality of angled cuts **34** which allow for a clamp **48** as shown in Figure 6 to ratchetly or otherwise retain the retractor shaft **16** at a desired position relative to a ring **46** or other appropriate structure. The shaft **16** preferably has a substantially square cross section along a majority of its length with a connection **36** at a distal end **38**.

[00015] The pivoting connection is preferably constructed having a flange clevis **20** which connects to the retractor shaft **16** with a pin **22**. The flange clevis **20** connects to a pivot flange **24** which pivots about pin **26** as shown in Figure 1. Preferably the flange

clevis **20** can pivot at least 60 degrees, if not 90 degrees to either side of shaft axis **17**. In other embodiments, ranges of +/- 30 degrees or +/- 45 degrees may also be utilized.

[00016] Figure 4 shows the pivot flange **24** apart from the assembly **10** shown in Figure 1. The pivot flange **24** has an extension **28** which is received in bore **30** of blade attachment boss **32** which connects with the pivot flange **24** as well as with a shoulder **14** of a retractor blade **12** as shown in Figure 1.

[00017] The connection **36** is in the form of a post with a bore **40** extending therethrough as shown in Figure 1.

[00018] The distal end **38** of the shaft **16** is illustrated in Figure 1 is inserted into receiver **42** shown in phantom in Figure 3. Pin **22** shown in Figure 1 extends through a hole **44** and bore **40** of the connector **36** to retain the shaft **16** relative to the flange clevis **20** as shown in Figure 1. It is anticipated that this will be a rigid and non-moveable connection, however, in alternative embodiments, this may not necessarily be the case.

[00019] Figure 3 shows the flange clevis **20** having a slot **50** which receives hub **56** of pivot flange **24** shown in Figure 4. The hub may have a circular circumference or, as illustrated in Figure 4, may be configured with stops **60,62** which when installed in the slot **50** as shown in Figure 1, cooperate with the slot 50 to prevent rotation of the hub **56** of more than about 60 degrees to the left or right of shaft axis **17** about rotation axis **60**. In other embodiments, the slot 50 may work to restrict the angular movement of the hub 56 independent of stops **60,62** on a hub or other structure. In other embodiments, the hub **56** may be constructed so that 90 degrees or more to the left and right of the shaft axis **17** may be allowed. Pin **26** retains the hub **56** in the slot **50** as shown in Figure 1 while allowing the hub **56** to pivot. Other connections like a ball and socket joint may be

utilized to accomplish this retention and movement capability. It should be understood that the term "pin" is a generic term and can be utilized to mean screw, post or other connection device.

[00020] The extension **28** of the pivot flange **24** is received within the bore **30** of the blade attachment boss **32** as shown in Figure 1. A pin **68** extends through bore **64** in the extension as well as through side slots **66** which not only accommodates the pin **68**, but also allows for pivoting about tilting axis **70**, at least to a limited degree such as less than about plus or minus twenty degrees relative to shaft axis **17**. Tilting axis **70** is preferably perpendicular to as well as spaced from rotation axis **60**.

[00021] The shoulder **14** of the blade **12** is captured within the mouth **72** of the balde attachment boss **32** and, depending on the tolerances of the shoulder **14** relative to the mouth **72**, a connector pin **74** may assist in retaining the shoulder **74** in the mouth **72**.

[00022] While the clamp **48** is substantially illustrated as a box in Figure 6, it could have sufficient more structure as shown in co-pending U.S. Patent Application No. 10/133,663 or other clamp configurations which show how the retractor shaft **16** can be configured to rotate relative to ring **46** about axes **52,54**. The pivoting of a retractor shaft **16** into an incision to direct a retractor blade **12** into a wound has been done, however, the retractor blade has been traditionally rigidly connected to the retractor shaft **16** in the prior art.

[00023] Accordingly, as the clamp **48** rotates the retractor shaft **16** downwardly, the tissue contact surface **76** shown in Figure 1 would be angled at a similar angle as the downward tilt of the retractor shaft **16** relative to the ring **16** at the clamp about the axis **52** in a prior art retractor. Accordingly, the connector **18** allows for the tissue contact

surface **76** to be maintained adjacent to tissue **58** (and perpendicular to the direction of retraction) as shown in Figure 6, even when the retractor shaft **16** is downwardly rotated about axis **52**.

[00024] Additionally, when the clamp **48** rotates about axis **54** relative to the ring **46** and/or the clamp **48** is positioned so that the plane extending through axis **54** and retractor shaft **16** does not intersect a plane perpendicular to the tissue contact surface **76** extending through stem **14**, the tissue contact surface **76** may be still maintained contact with the tissue **58** since the slot **50** allows for the side to side rotation, pivoting or swiveling of the hub **56** about the rotation axis **60**, and thus the stem **14** and tissue contact surface **56** of the retractor blade **12** so that it maintains optimal contact with tissue **58** as shown in Figure 5.

[00025] In the preferred embodiment, the hub **56** is free to pivot about rotation axis **60** as necessary within slot **50**, however in other embodiments, the slot **50** may be configured to lock the hub **56** in a desired position, if necessary. The pin **68** is also free to move within side slots **66** in the preferred embodiment to allow up and down movement about tilting axis.

[00026] Rings **46** known in the art are not necessarily circular in their circumference, and some rings may then be substantially linear. Furthermore, there are a plurality of different kinds of clamps **48** apart from those described and illustrated in co-pending application No. 10/113,663 which could utilize the assembly **10** shown and described herein.

[00027] Although most retractor shafts **16** have a square cross section along a linear length, other cross sectional shapes could also be utilized in accordance with the present

invention. Furthermore, depending on a particular anticipated uses and angular relationship of the shoulder **14** relative to retractor shaft **16,** the angular travel both laterally (i.e., from side to side as well as top to bottom) may be adjusted. This is believed to assist in maintaining the tissue contact surface **56** in an incision against tissue **58**. While the preferred top to bottom range of motion is less than +/- 30° and more particularly about +/- 20 degrees, and the preferred range of side to side motion is about 120°, these angles may be restricted and/or expanded depending on the particular needs of the retractor system and assembly **10** utilized.

[00028] Numerous alterations of the structure herein disclosed will suggest themselves to those skilled in the art. However, it is to be understood that the present disclosure relates to the preferred embodiment of the invention which is for purposes of illustration only and not to be construed as a limitation of the invention. All such modifications which do not depart from the spirit of the invention are intended to be included within the scope of the appended claims.

[00029] What is claimed is: